REMARKS

The Present Invention

The present invention relates to a polishing system and composition for use in polishing a substrate, particularly a multi-layer substrate that includes a first metal layer and a second layer. Claims 1-6, 11-31, 36-44, and 47-67 currently are pending.

Discussion of the Amendments

The abstract has been shortened to comply with the 150-word limit and to only refer to the subject matter of the pending claims.

Summary of the Office Action

The Office Action makes the restriction requirement set forth in the previous action final, and accordingly withdraws claims 2, 5, 6, 20, 21, 23, 25, 41, 43, 47, 48, 50, and 52-67 from further consideration. The Office Action also asserts that the abstract does not conform to the generally accepted format. Lastly, the Office Action rejects claims 1, 3, 4, 11-19, 22, 24, 26-31, 36-40, 42, 44, 49, and 51 under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent No. 6,136,714 (Schutz et al.) (hereinafter "the Schutz '714 patent") in view of U.S. Patent No. 5,897,375 (Watts et al.) (hereinafter "the Watts '375 patent") or U.S. Patent No. 5,954,997 (Kaufman et al.) (hereinafter "the Kaufman '997 patent").

Discussion of the Restriction Requirement

The Office Action acknowledges Applicants' election, with traverse, of claims 1, 3, 4, 11-19, 22, 24, 26-31, 36-40, 42, 44, 49, and 51. However, the Office Action makes the restriction requirement final and asserts that Applicants' traversal was not persuasive, insofar as the search and examination of the entire application would entail different searches and impose a serious administrative burden on the examiner. The Office Action also withdraws elected claim 43 from further consideration in view of the fact that it contains the same limitations as non-elected claim 23.

Discussion of the Obviousness Rejection

The Office Action rejects the pending claims as allegedly encompassing obvious subject matter in view of the Schutz '714 patent, the Watts '375 patent, and/or the Kaufman '997 patent. In particular, the Office Action asserts that the Schutz '714 patent discloses a system for polishing one or more layers of a multi-layer substrate, the system comprising a

liquid carrier, a polishing additive (e.g., tartaric acid), a stopping compound (e.g., polyethylenimine), and an abrasive (e.g., alumina or silica). The Office Action acknowledges that the Schutz '714 patent fails to teach or suggest a polishing system comprising an oxidizing agent and at least one passivation film forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing rings, but asserts that such a system would have been obvious in view of the Watts '375 patent or the Kaufman '997 patent. Applicants traverse the obviousness rejection.

The Schutz '714 patent generally discloses a method for enhancing the removal rate of a metal barrier on a semiconductor substrate using a chemical-mechanical polishing slurry containing a metal removal-enhancing amount of at least one chelating agent. In particular, the Schutz '714 patent provides that the chemical-mechanical polishing slurry can be a conventional chemical-mechanical polishing slurry which further comprises a chelating agent (see, e.g., the Schutz '714 patent at col. 3, lines 31-63). The Schutz '714 patent further provides that suitable chelating agents include polyphosphonates, aminocarboxylic acids, 1,3-diketones, trifluoroacetylacetone, thenoyltrifluoroacetone, hydroxycarboxylic acids (e.g., tartaric acid), polyamines, aminoalcohols, aromatic heterocyclic bases, phenols, aminophenols, oxines, Schiff bases, tetrapyroles, sulfur compounds, synthetic macrocyclic compounds, polymeric chelating agents (e.g., polyethylenimine), and phosphonic acids (the Schutz '714 patent at col. 4, lines 5-35).

Thus, to the extent that the Schutz '714 patent discloses a polishing slurry comprising tartaric acid or polyethylenimine, the compounds are merely provided, *in the alternative*, in a "laundry list" of suitable chelating agents. Indeed, contrary to the Office Action's assertions, the Schutz '714 patent does not disclose or suggest a polishing slurry comprising two or more chelating agents. The Schutz '714 patent's repeated references to the chelating agent contained in the polishing slurry are consistently in the singular (see, e.g., the Schutz '714 patent at col. 2, lines 22-43, col. 3, lines 59-67, and col. 4, lines 42-63). While the Schutz '714 patent does, in one place, refer to the "amount of chelators contacted with the wafer," this lone reference to the chelating agent in the plural cannot properly be considered to rise to the level of teaching a combination of two or more chelating agents, especially in view of the fact that the Schutz '714 patent does not even mention mixtures of chelating agents in its lengthy description of suitable chelating agents (see, e.g., the Schutz '714 patent at col. 4, lines 5-40).

Furthermore, as noted above, the Schutz '714 patent teaches that all of the listed compounds are equivalent for their intended purpose, namely, as chelating agents. Thus, insofar as the disclosed chelating agents are taught to be equivalent for the same purpose, one

of ordinary skill in the art, at the time of invention, would not have expected any benefit to be derived from combining two or more of the disclosed chelating agents. Accordingly, the Schutz '714 patent cannot properly be considered to teach or suggest a polishing slurry comprising two or more chelating agents. Moreover, even if the Schutz '714 patent did teach a polishing slurry comprising two or more chelating agents, which it does not, there is nothing within the reference that would have motivated one of ordinary skill in the art to select tartaric acid and a polyethylenimine from the exhaustive list of suitable chelating agents provided.

The Watts '375 and Kaufman '997 patents do not remedy the deficiencies of the Schutz '714 patent. The Watts '375 patent generally discloses a chemical-mechanical polishing slurry comprising an oxidizing agent, a citrate salt, 1,2,4-triazole or a triazole derivative, an abrasive, and a liquid carrier (see, e.g., the Watts '375 patent at col. 2, lines 26-37). The Kaufman '997 patent generally discloses a chemical-mechanical polishing slurry comprising a film forming agent (e.g., benzotriazole), an oxidizer, a complexing agent (e.g., tartaric acid), and an abrasive. Thus, while the Watts '375 and Kaufman '997 patents may suggest a polishing slurry comprising a carboxylic acid (e.g., tartaric acid) or a carboxylic acid derivative (e.g., a citrate salt), the subject matter of the pending claims would not have been obvious over the Schutz '714 patent in view of either reference.

In particular, the cited references teach that the carboxylic acid or carboxylic acid derivative contained in the polishing slurries of the Watts '375 and the Kaufman '997 patents functions as a chelating agent for the metal barrier layer (see, e.g., the Schutz '714 patent at col. 4, lines 13-14, and the Kaufman '997 patent at col. 6, lines 5-7). Furthermore, as noted above, the Schutz '714 patent teaches that both the carboxylic acids and polymeric chelating agents (e.g., polyethylenimine) function as chelating agents for the metal barrier layer. Accordingly, one of ordinary skill in the art, at the time of invention, would have expected the carboxylic acid or carboxylic acid derivative contained in the polishing slurries of the Watts '375 and the Kaufman '997 patents to perform the same function as the chelating agent of the Schutz '714 patent.

Moreover, insofar as none of the cited references teaches or suggests an expected benefit to be derived from combining two or more chelating agents, one of ordinary skill in the art, at the time of invention, would not have been motivated to combine the cited references in such a way as to arrive at a polishing slurry comprising a carboxylic acid or carboxylic acid derivative and a second chelating agent. Indeed, one of ordinary skill in the art, having read the disclosures of the cited references, would have expected such combination to be redundant and would have expected no benefit to be derived from such a

combination. Lastly, even if the cited references did disclose or suggest a polishing slurry comprising two or more "chelating agents," which they do not, there is nothing within the cited references that would have motivated one of ordinary skill in the art to select the combination of a carboxylic acid and a polyethylenimine. As noted above, polyethylenimine is merely provided as one suitable chelating agent in a "laundry list" of suitable chelating agents that encompasses hundreds, if not thousands, of compounds. Accordingly, the cited references, taken alone or in combination, cannot properly be considered to teach or suggest a polishing slurry comprising two or more "chelating agents," much less a polishing slurry comprising a carboxylic acid polishing additive (e.g., tartaric acid) and polyethylenimine, as recited in the elected species.

In view of the foregoing, the pending claims recite subject matter that is both novel and nonobvious over the Schutz '714, the Watts '375, and the Kaufman '997 patents. The Section 103 rejection of the pending claims, therefore, should be withdrawn.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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